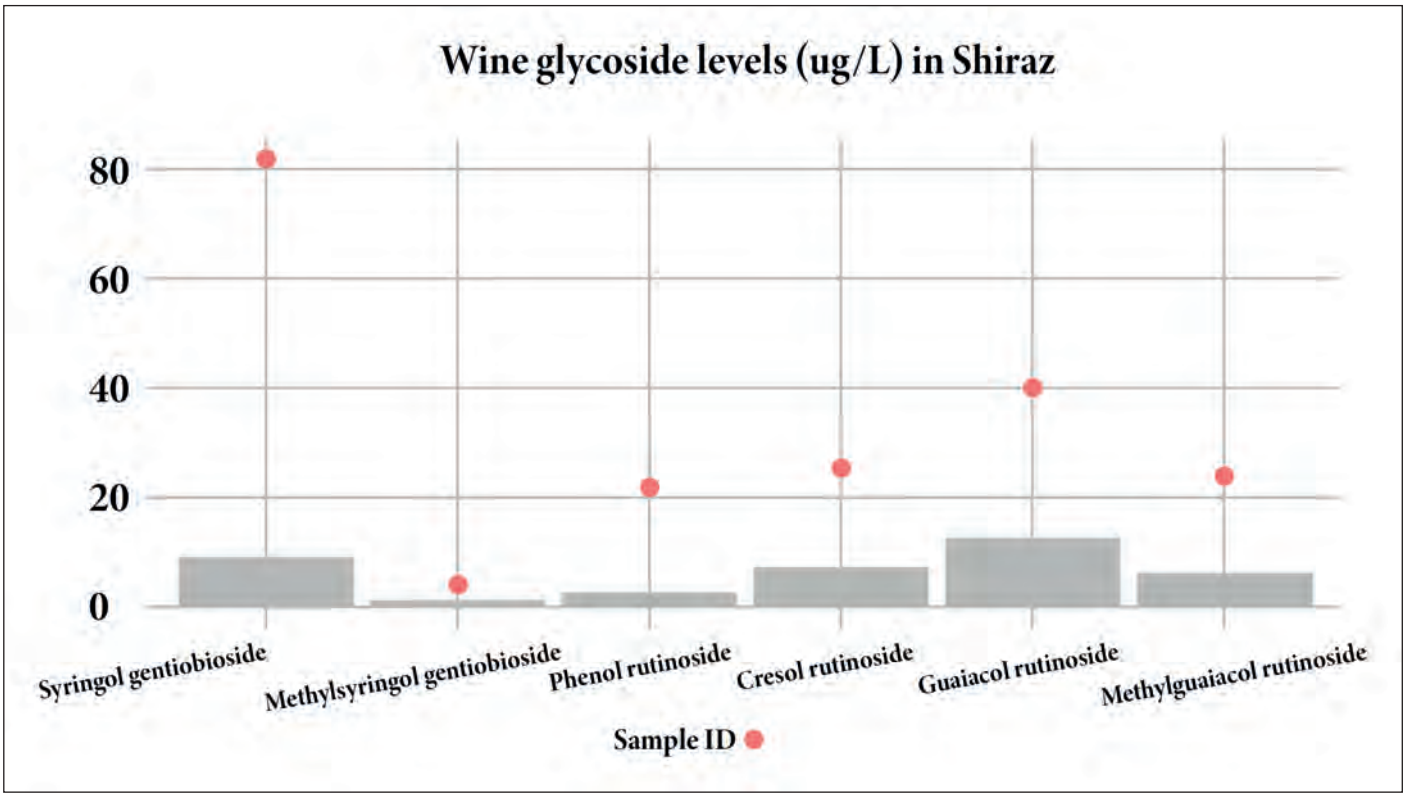
Interpreting AWRI smoke panel analysis results

AWRI Commercial Services has recently changed the way smoke panel analysis results are reported. Apart from the numerical results, reports now include graphs showing where the results sit compared to levels typically present in non-smoke-exposed grapes or wines. In this column, Senior Oenologist **Adrian Coulter** explains various aspects of the graphical results and how they should be interpreted.



Example of a graph from an AWRI Commercial Services smoke panel analysis report for the glycoside smoke marker compounds in Shiraz wine. All the marker compounds analysed in this wine are above the background levels, indicating the grapes from which the wine was made were exposed to smoke.

What is the background level data referred to in the reports?

It has been firmly established that an elevated concentration of several volatile phenols and their glycosides in grapes and wines is associated with exposure of grapes to smoke. Consequently, these compounds have been used as markers of smoke exposure. However, it has also been found that traces of these compounds can be detected in non-smoke-exposed samples. This complicates the interpretation of smoke panel analysis results. To address this, the AWRI collected data on the trace levels of smoke marker compounds in non-smoke exposed grapes of 12 varieties collected from multiple regions across Australia over four vintages. The data collected is generally described as the 'background levels database' and contains more than 1,000 samples to date. The grapes that were collected were fermented to wine and the levels of marker compounds in the wines were also recorded and added to the database. The resulting database therefore provides information on the marker compound 'background levels' naturally present in grapes that have not been exposed to smoke and the wines made from those grapes. Smoke panel analysis results can then be compared to the background levels database to determine the likelihood of smoke exposure.

What are the grey bars in the smoke panel analysis graphs?

The grey bars represent the upper limits of smoke marker compounds expected in Australian grapes and wines from non-smoke-exposed vineyards of the particular variety tested. In statistical terms, the value corresponding to the top of a grey bar for a particular marker compound is the 99th percentile of the background data for that compound. That is, 99% of the background data for the compound fall below this value for the particular variety.

Why does the variety make a difference to the results interpretation?

While examination of the background data showed there was no clear variation in the levels of marker compounds according to region and vintage, differences were observed between varieties. Therefore, it is recommended that interpretation be applied on a 'per variety' basis. It is suspected that genetic differences between grape varieties are probably responsible for differences observed.

What if my variety isn't one of the 12 varieties in the background levels database?

While the 12 varieties in the background levels database represent the majority of plantings in Australia, there will of course be samples tested that are varieties not in the database. In cases where the variety submitted for testing is not one in the background levels database, the results will be compared to a variety that has similar characteristics, based on genetic parentage and/or physiological attributes. For example, Verdelho and Petit Verdot would be compared to the data for Chardonnay and Cabernet Sauvignon, respectively. This is not ideal, but the results still give an indication of the likelihood of smoke exposure.

Can the risk of smoke taint be determined from the smoke panel analysis results?

The background levels dataset is only intended to be a guide for determining whether there has been smoke exposure in Australian grapes and wines, not a tool for inferring smoke taint. If the results for a sample all fall within the grey bars on the results graph, then the interpretation is that there is no evidence of smoke exposure. If there is no evidence of exposure, then it is highly unlikely smoke taint would be detected by sensory assessment. If the analysis results for a grape sample are above the grey bars on the results graph, then the interpretation would be that the grapes were exposed to smoke. However, no conclusion about any possible sensory impact the exposure might have on a resulting wine can be made.

It is expected that the risk of producing a wine affected by smoke taint would increase with increasing grape marker compound levels above the grey bars, especially when the results approach or exceed the sensory threshold values reported for the compounds. However, a direct relationship between degree of elevation above the 99th percentile values (the tops of the grey bars) in grapes and sensory impact on the resultant wine has not yet been established. This is the topic of ongoing research.

If it is intended to analyse wine samples for evidence of smoke exposure, then it is recommended that they not have any contact with oak. Oak maturation can result in extraction of volatile phenols (due to toasting), some of which are picked up by the smoke panel analysis. This makes it difficult to attribute elevated volatile phenol results to smoke exposure. Ideally, wine analysis should be combined with robust sensory assessments. This will give an indication of smoke exposure and the intensity of any perceived smoke taint.

Can I access the background data used to plot the grey bars in the graphs?

A paper on the subject of the background levels database has recently been accepted for publication (Coulter et al. 2022) and the 99th percentile values are included in tables within the paper. The paper is open access and can be downloaded from the Wiley Online Library.

When should grapes be sampled for analysis after smoke exposure?

The grapes sampled for the background levels database were obtained from fully developed grapes sampled approximately two weeks before the targeted commercial harvest date. Consequently, it is recommended that grapes be sampled approximately two weeks before harvest if smoke panel analysis results are going to be compared to the background levels database.

For further information on interpretation of smoke panel analysis results, contact the AWRI helpdesk on helpdesk@awri.com.au or 08 8313 6600.

Reference

Coulter, A., Baldock, G.A., Parker, M., Hayasaka, Y., Francis, I.L., Herderich, M. 2022. The concentration of smoke marker compounds in non-smoke-exposed grapes and wine in Australia. *Aust. J. Grape Wine Res.* In press. GW